

Technical Bulletin

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Subject: **AD-2 AIR DRYER INSTALLATION RECOMMENDATIONS**

The thousands of Bendix Air Dryers operating successfully in the field today attest to the success of this unique filtration device.

A key factor in the successful operation and expected service life of the air dryer is proper installation. Several factors are to be considered:

Operational Limitations

Because the air dryer is a regenerative type device, sufficient "purge" time must be allowed. The dryer purge cycle is controlled by the governor and occurs when the governor is in the "cut-out" position (compressor not compressing air).

The air dryer can be used on any vehicle where normal compressor loaded time is 90 seconds or less and unloaded is 30 seconds or more. On vehicles where the compressor remains loaded for longer periods of time, increasing the purge volume may provide for satisfactory operation; however, in such case it is recommended that a Bendix H.V.S.G. representative or Bendix H.V.S.G. Engineering be contacted for recommendations before proceeding with the installation.

Installation Recommendations

1. The dryer should be mounted securely outside the engine compartment in an area of air flow when the vehicle is in motion. Do not mount close to heat producing components such as exhaust stacks or the exhaust system.
2. The dryer must be mounted vertically with the purge valve exhaust towards the ground. Connection from the governor unloader port to purge valve should be a constantly declining line. Avoid routing the line over heat producing areas (exhaust system, etc.).
3. The air dryer is installed in the compressor discharge line, not less than six feet from a two cylinder compressor or ten feet from a single cylinder compressor when using copper tubing. Teflon hose or wire braid hose can be substituted for copper tubing using a 1½' to 1' ratio:

- Examples:
1. Six feet of copper tubing can be replaced by nine feet of either teflon or wire braid hose.
 2. Six feet of copper tubing can be replaced by three feet of copper tubing plus four and one-half feet of either teflon or wire braid hose.

Maximum efficiency of the air dryer is dependent upon the discharge line cooling the air before it reaches the air dryer; maximum air temperature at the dryer inlet should not exceed 150°F (66°C).

4. The heating unit in the end cover prevents the purge valve from freezing. The heater is thermostatically controlled with an operating range between 45°F (7°C) and 85°F (29°C). Number 16 wire should be used, connecting to the “on” position side of the engine control switch. Fuse with an 8 to 10 amp fuse on 12-volt systems or a 4 to 5 amp fuse on 24 volt systems.

Desiccant Life

Compressor condition: The desiccant in the air dryer can handle the small amount of oil passed by all compressors and provide satisfactory life; however, excessive amounts of oil passed by the compressor will shorten desiccant life.

Proper application and installation: As discussed previously, proper application and installation are extremely important in achieving satisfactory desiccant life.

Desiccant Replacement

The desiccant should be replaced when it is determined that the desiccant is sufficiently contaminated to affect its ability to remove water and oil vapor. This test can be made by checking for excessive contaminants in the first reservoir every three months; 25,000 miles or 900 operating hours. Small amounts of water caused by condensation will occur in areas where more than 30°F temperature variation occurs, however, the presence of larger amounts of liquid may be an indication that the desiccant should be changed.

It is generally recommended that the desiccant be replaced yearly; however, if experience has shown that shortened or extended life has resulted in a particular installation, the replacement interval should be reduced or increased accordingly.

To aid in proper maintenance of the air dryer and to assure proper installation, we have developed the attached troubleshooting chart. This troubleshooting chart will eventually be included in Service Data Sheet SD-08-2.

AD-2 AIR DRYER TROUBLESHOOTING CHART

SYMPTOM	CAUSE	REMEDY
1. Dryer is constantly "cycling" or purging.	<p>A. Excessive system leakage.</p> <p>B. Excessive leakage in fittings, hoses and tubing connected to compressor, air dryer and first reservoir.</p> <p>C. Defective check valve between air dryer and first reservoir. (In standard AD-2, check valve to outlet port.)</p> <p>D. Defective governor.</p> <p>E. Leaking purge valve in air dryer end cover (control side).</p> <p>F. Compressor unloader mechanism leaking excessively.</p>	<p>A. Test for excessive leakage and repair. Allowable leakage: Pre-121 vehicles, single vehicle - 2 psi/minute. Tractor trailer - 3 psi/minute. 121 vehicles, single vehicle - 1 psi/minute per service reservoir. Tractor trailer - 3 psi/minute per service reservoir.</p> <p>B. Using soap solution, test for leakage at fittings, drain valve (if any) and safety valve in first reservoir. Repair or replace as necessary.</p> <p>C. Test check valve. Leakage should not exceed 1" soap bubble in five seconds. It may be necessary to remove check valve to test. Repair or replace as necessary.</p> <p>D. Test governor for proper cut-in or cut-out pressures and excessive leakage in both positions.</p> <p>E. Remove end cover. Apply 120 psi at control port. Soap both sides around purge valve to test for control piston leakage. (Permissible leakage - 1" bubble in five seconds.)</p> <p>F. Remove air strainer or fitting from compressor inlet cavity. With compressor unloaded, check for unloader piston leakage. Slight leakage permissible.</p>
2. Water in vehicle reservoirs.	<p>A. Desiccant requires replacement.</p> <p>B. Improper discharge line length or improper line material.</p> <p>C. Air system charged from outside air source (outside air not passing through air dryer).</p> <p>D. Air dryer not purging (see Symptom #5).</p> <p>E. Purge (air exhaust) time insufficient due to excessive system leakage (see causes for Symptom #1).</p> <p>F. Air dryer/vehicle application requires additional purge volume.</p> <p>G. Air dryer not compatible with vehicle air system requirement - (Improper air dryer/vehicle application).</p>	<p>A. Replace desiccant cartridge.</p> <p>B. Minimum of six-foot metal tubing for two-cylinder compressor; ten-foot for one-cylinder compressor. Flex hose can be substituted at ratio of 1-1/2' flex hose for each 1' of metal.</p> <p>C. If system must have outside air fill provision, outside air should pass through air dryer. (Unused inlet on air dryer can be used.) Use of this should be minimized.</p> <p>D. See cause and remedy for Symptom #5.)</p> <p>E. Check causes and remedies for Symptom #1.</p> <p>F. When compressor is loaded (compressing) longer than 90 seconds during normal operation, additional purge volume may be needed. (Before proceeding, contact Bendix representation for consultation.)</p> <p>G. Air dryer requires minimum purge time of 30 seconds. If compressor stays loaded longer than 90 seconds and additional purge volume is added, longer purge time is required. Air dryer efficiency will decrease as compressor loaded time increases beyond 120 seconds, during normal operation of the vehicle. (This limitation assumes a compressor of approximately 12 CFM and engine operation at 1600-1900 RPM.) The air dryer will accommodate occasional longer loaded times, such as initial system build-up.</p>
3. Safety valve on air dryer "popping off" or exhausting air.	<p>A. Desiccant cartridge plugged or saturated.</p> <p>B. Defective check valve between air dryer outlet port and first reservoir. (in standard AD-2, check valve in outlet port.)</p> <p>C. Defective fittings, hose or tubing between air dryer and first reservoir.</p>	<p>A. Check compressor for excessive oil passing and/or correct compressor installation. Repair or replace as necessary. Rebuild or replace cartridge.</p> <p>B. Test to determine if air is passing through check valve. Repair or replace.</p> <p>C. Check to determine if air is reaching first reservoir. Inspect for kinked tubing or hose. Check for undrilled or restricted hose or tubing fittings.</p>

SYMPTOM	CAUSE	REMEDY
4. Constant exhaust of air at air dryer purge valve exhaust or unable to build system pressure.	A. Air dryer purge valve leaking excessively. B. Defective governor. C. Purge control line connected to reservoir or exhaust port of governor. D. Purge valve frozen open - faulty heater and thermostat, wiring, blown fuse. E. Inlet and outlet air connections reversed. F. Check valve between air dryer and first reservoir defective. G. Kinked or blocked (plugged) discharge line. H. Excessive bends in discharge line (water collects and freezes). I. Excessive system leakage.	A. With compressor loaded , apply soap solution on purge valve exhaust, to test for excessive leakage. Repair purge valve as necessary. B. Check governor for proper "cut-in", "cut-out" pressure and excessive leakage in both positions. Repair or replace as necessary. C. Purge control line must be connected to unloader port of governor. D. Test for blown fuse or broken wire to air dryer. Allow end cover to completely cool below 45°F. End cover should be warm to touch within moments of turning on ignition; if not, end cover should be replaced. (Heater/thermostat not serviceable.) E. Compressor discharge to inlet port. Reconnect lines properly. F. Test check valve for proper operation (see Symptom #3, Remedy B). G. Check to determine if air passes through discharge line. Check for kinks, bends, excessive carbon deposits. H. Discharge line should be constantly sloping from compressor to air dryer with as few bends as possible. I. See Symptom #1's Causes and Remedies.
5. Air dryer does not purge or exhaust air.	A. Broken, kinked, frozen, plugged or disconnected purge control line. B. Faulty air dryer purge valve. C. See Causes B,E,F,G,H, for Symptom #4.	A. Test to determine air flows through purge control line when compressor unloaded. Check for undrilled fittings. (See Symptom #4, Remedy C.) B. After determining air reaches purge valve (Remedy A above), repair purge valve. C. Refer to Remedies B, E, F, G, H, for Symptom #4.
6. Desiccant material being expelled from air dryer purge valve exhaust (may look like whitish liquid or paste or small beads).	A. This symptom is almost always accompanied by one or more of Symptoms 1,2,3,4 and 5. See related causes for these Symptoms above. B. Air dryer not securely mounted. (Excessive vibration). C. Defective cloth covered perforated plate in air dryer desiccant cartridge or improperly rebuilt desiccant cartridge. D. Compressor passing excessive oil. E. Faulty heater and thermostat, wiring, fuse not allowing purge. (Cold weather operation only.)	A. See Causes and Remedies for Symptoms 1,2,3,4 and 5. B. Vibration should be held to minimum. Add bracket supports or change air dryer mounting location if necessary. C. Replace or rebuild desiccant cartridge. NOTE: If rebuilding cartridge, carefully follow instructions packed with cartridge rebuild kit. D. Check for proper compressor installation; if symptoms persist, replace compressor. E. Refer to Remedy D under Symptom #4.
OR Unsatisfactory desiccant life.		
7. Unable to remove end cover, or unable to install new desiccant cartridge.	A. Result of reversing the inlet and outlet connections. (See Symptom #4, Cause E.)	A. Refer to Symptom #4, Cause E.
8. Air dryer end cover separates from air dryer housing during operation.	A. Excessive system pressure build up within air dryer; caused by either plugged desiccant, check valve failure, frozen or obstructed discharge line (between air dryer and first reservoir) or governor failure in conjunction with safety valve failure.	A. Because it is difficult to determine extent of internal damage to air dryer, it is recommended that the air dryer be replaced. NOTE: This type of failure can be prevented by checking the dryer for proper operation every three (3) months.